

## 2GR-FE ENGINE MECHANICAL

### SERVICE DATA

Engine	Ignition timing	When using the intelligent tester		8 to 12° BTDC @ idle
		When not using the intelligent tester	Connect SST	8 to 12° BTDC @ idle
			Disconnect SST	5 to 15° BTDC @ idle
	Idle speed	When using the intelligent tester		600 to 700 rpm
		When not using the intelligent tester		600 to 700 rpm
	Compression	Compression pressure		1,400 kPa (14 kgf/cm <sup>2</sup> , 199 psi) or more
		Minimum pressure		980 kPa (10.0 kgf/cm <sup>2</sup> , 142 psi)
		Difference between each cylinder		100 kPa (1.0 kgf/cm <sup>2</sup> , 15 psi) or less
Intake manifold	Warpage	Maximum	Intake manifold side	0.8 mm (0.031 in.)
			Cylinder head side	0.2 mm (0.008 in.)
Exhaust manifold	Warpage	Maximum		0.70 mm (0.0028 in.)
Connecting rod	Thrust clearance	Standard		0.15 to 0.40 mm (0.0059 to 0.0157 in.)
		Maximum		0.50 mm (0.0197 in.)
	Oil clearance	Standard		0.045 to 0.067 mm (0.0018 to 0.0026 in.)
		Maximum		0.070 mm (0.0028 in.)
	Big end inside diameter	Mark 1		56.000 to 56.006 mm (2.2047 to 2.2050 in.)
		Mark 2		56.007 to 56.012 mm (2.2050 to 2.2052 in.)
		Mark 3		56.013 to 56.018 mm (2.2052 to 2.2054 in.)
		Mark 4		56.019 to 56.024 mm (2.2055 to 2.2057 in.)
	Standard sized bearing center wall thickness	Mark 1		1.481 to 1.484 mm (0.0583 to 0.0584 in.)
		Mark 2		1.484 to 1.497 mm (0.0584 to 0.0585 in.)
		Mark 3		1.487 to 1.490 mm (0.0585 to 0.0587 in.)
		Mark 4		1.490 to 1.493 mm (0.0587 to 0.0588 in.)
	Bend	Maximum		0.05 mm (0.0020 in.) per 100 mm (3.94 in.)
	Twist	Maximum		0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

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Crankshaft	Pin diameter	Standard		52.992 to 53.000 mm (2.0863 to 2.0866 in.)
	Thrust clearance	Standard		0.04 to 0.24 mm (0.0016 to 0.0094 in.)
		Maximum		0.30 mm (0.0118 in.)
	Thrust washer thickness	Standard		2.43 to 2.48 mm (0.0957 to 0.0976 in.)
	Main journal diameter	Standard	Mark 00	60.999 to 61.000 mm (2.4015 to 2.4016 in.)
			Mark 01	60.998 to 60.999 mm (2.4015 to 2.4015 in.)
			Mark 02	60.997 to 60.998 mm (2.4015 to 2.4015 in.)
			Mark 03	60.996 to 60.997 mm (2.4014 to 2.4015 in.)
			Mark 04	60.995 to 60.996 mm (2.4014 to 2.4014 in.)
			Mark 05	60.994 to 60.995 mm (2.4013 to 2.4014 in.)
			Mark 06	60.93 to 60.994 mm (2.4013 to 2.4013 in.)
			Mark 07	60.992 to 60.993 mm (2.4013 to 2.4013 in.)
			Mark 08	60.991 to 60.992 mm (2.4012 to 2.4013 in.)
			Mark 09	60.990 to 60.991 mm (2.4012 to 2.4012 in.)
			Mark 10	60.989 to 60.990 mm (2.4011 to 2.4012 in.)
			Mark 11	60.988 to 60.989 mm (2.4.11 to 2.4011 in.)
Crankshaft	Upper bearing center wall thickness	Standard No. 1 and No. 4 journal	Mark 1	2.500 to 2.503 mm (0.0984 to 0.0985 in.)
			Mark 2	2.503 to 2.506 mm (0.0985 to 0.0987 in.)
			Mark 3	2.506 to 2.509 mm (0.0987 to 0.0988 in.)
			Mark 4	2.509 to 2.512 mm (0.0988 to 0.0989 in.)
			Mark 5	2.512 to 2.515 mm (0.0989 to 0.0990 in.)
		Standard No. 2 and No. 3 journal	Mark 1	2.478 to 2.481 mm (0.0976 to 0.0977 in.)
			Mark 2	2.481 to 2.484 mm (0.0977 to 0.0978 in.)
			Mark 3	2.484 to 2.487 mm (0.0978 to 0.0979 in.)
			Mark 4	2.487 to 2.490 mm (0.0979 to 0.0980 in.)
			Mark 5	2.490 to 2.493 mm (0.0980 to 0.0981 in.)

Crankshaft	Lower bearing center wall thickness	Standard No. 1 and No. 4 journal	Mark 1	2.478 to 2.481 mm (0.0976 to 0.0977 in.)
			Mark 2	2.481 to 2.484 mm (0.0977 to 0.0780 in.)
			Mark 3	2.484 to 2.487 mm (0.0978 to 0.0979 in.)
			Mark 4	2.487 to 2.490 mm (0.0979 to 0.0980 in.)
			Mark 5	2.490 to 2.493 mm (0.0980 to 0.0981 in.)
		Standard No. 2 and No. 3 journal	Mark 1	2.500 to 2.503 mm (0.0984 to 0.0985 in.)
			Mark 2	2.503 to 2.506 mm (0.0985 to 0.0987 in.)
			Mark 3	2.506 to 2.509 mm (0.0987 to 0.0988 in.)
			Mark 4	2.509 to 2.512 mm (0.0988 to 0.0989 in.)
			Mark 5	2.512 to 2.515 mm (0.0989 to 0.0990 in.)
	Circle runout	Maximum		0.06 mm (0.0024 in.)
	Journal diameter	Standard		60.988 to 61.00 mm (2.4011 to 2.4016 in.)
Camshaft	Taper and out-of-round	Maximum		0.02 mm (0.0008 in.)
	Crank pin diameter	Standard		52.992 to 53.000 mm (2.0863 to 2.0866 in.)
	Taper and out-of-round	Maximum		Taper and out-of-round 0.02 mm (0.0008 in.)
	Circle runout	Maximum		0.04 mm (0.0016 in.)
	Cam lobe height	Standard	Intake	44.316 to 44.416 mm (1.7447 to 1.7487 in.)
			Exhaust	44.262 to 44.362 mm (1.7426 to 1.7465 in.)
		Maximum	Intake	44.166 mm (1.7388 in.)
			Exhaust	44.112 mm (1.7367 in.)
	Journal diameter	Standard	No. 1 journal	35.946 to 35.960 mm (1.4152 to 1.4157 in.)
			Other journal	25.959 to 25.975 mm (1.0220 to 1.0226 in.)
	Thrust clearance (bank 1)	Standard		0.08 to 0.13 mm (0.0031 to 0.0051 in.)
		Maximum		0.15 mm (0.006 in.)
	Thrust clearance (bank 2)	Standard		0.08 to 0.13 mm (0.0031 to 0.0051 in.)
		Maximum		0.15 mm (0.006 in.)
	Oil clearance	Standard	No. 1 journal	0.040 to 0.079 mm (0.0016 to 0.0031 in.)
			Other journal	0.025 to 0.062 mm (0.0010 to 0.0024 in.)
		Maximum	No. 1 Journal	0.10 mm (0.0039 in.)
			Other journal	0.09 mm (0.0035 in.)
Timing chain	Chain elongation	Maximum		136.9 mm (5.389 in.)
No. 2 timing chain	Chain elongation	Maximum		137.6 mm (5.417 in.)
Crankshaft timing gear or sprocket	Sprocket diameter (w/ chain)	Minimum		61.4 mm (2.417 in.)

Idle sprocket	Sprocket diameter (w/ chain)	Minimum		61.4 mm (2.417 in.)
Idle gear shaft	Idle gear shaft diameter	Standard		22.987 to 23.000 mm (0.9050 to 0.9055 in.)
	Idle gear inside diameter	Standard		23.02 to 23.03 mm (0.9062 to 0.9067 in.)
	Oil clearance	Standard		0.02 to 0.043 mm (0.0001 to 0.0017 in.)
		Maximum		0.043 mm (0.0017 in.)
No. 2 chain tensioner	Depth	Maximum		0.9 mm (0.035 in.)
No. 3 chain tensioner	Depth	Maximum		0.9 mm (0.035 in.)
Chain tensioner slipper	Depth	Maximum		1.0 mm (0.039 in.)
No. 1 chain vibration damper	Depth	Maximum		1.0 mm (0.039 in.)
No. 2 chain vibration damper	Depth	Maximum		1.0 mm (0.039 in.)
Cylinder head	Warpage	Standard	Cylinder head lower side	0.05 mm (0.0020 in.)
			Intake side	0.08 mm (0.0031 in.)
			Exhaust side	0.08 mm (0.0031 in.)
		Maximum		0.10 mm (0.0039 in.)
	Protrusion height	Standard		18.0 to 19.0 mm (0.71 to 0.75 in.)
Intake valve guide bush	Cylinder bore diameter	Standard		10.285 to 10.306 mm (0.4049 to 0.4057 in.)
	Bush bore diameter	Standard	Use STD	10.335 to 10.356 mm (0.4069 to 0.4077 in.)
			Use O/S	0.05 10.285 to 10.306 mm (0.4049 to 0.4057 in.)
	Protrusion height	Standard		9.1 to 9.9 mm (0.3582 to 0.3900 in.)
Exhaust valve guide bush	Cylinder bore diameter	Standard		10.285 to 10.306 mm (0.4049 to 0.4057 in.)
	Bush bore diameter	Standard	Use STD	10.335 to 10.356 mm (0.4069 to 0.4077 in.)
			Use O/S 0.05	10.285 to 10.306 mm (0.4049 to 0.4057 in.)
	Protrusion height	Standard		9.30 to 9.70 mm (0.3661 to 0.3819 in.)
Intake valve	Valve stem diameter	Standard		5.470 to 5.485 mm (0.2154 to 0.2159 in.)
	Margin thickness	Standard		1.0 mm (0.0394 in.)
		Minimum		0.50 mm (0.0197 in.)
	Overall length	Standard		105.85 mm (4.1673 in.)
		Minimum		105.35 mm (4.1476 in.)
Exhaust valve	Valve stem diameter	Standard		5.465 to 5.480 mm (0.2151 to 0.2157 in.)
	Margin thickness	Standard		1.0 mm (0.0394 in.)
		Minimum		0.50 mm (0.0197 in.)
	Overall length	Standard		110.40 mm (4.3464 in.)
		Minimum		109.90 mm (4.3268 in.)
Inner compression spring	Free length	Standard		45.46 mm (1.7898 in.)
	Deviation	Maximum		1.0 mm (0.039 in.)
	Angle (reference)	Maximum		2°

Valve guide bush	Bush inside diameter	Standard		5.51 to 5.53 mm (0.2169 to 0.2177 in.)
	Clearance	Standard	Intake	0.025 to 0.060 mm (0.0010 to 0.0024 in.)
			Exhaust	0.030 to 0.065 mm (0.0012 to 0.0026 in.)
		Maximum	Intake	0.08 mm (0.0031 in.)
			Exhaust	0.10 mm (0.0039 in.)
Cylinder block	Warpage	Maximum		0.07 mm (0.0028 in.)
	Bore diameter	Standard		94.000 to 94.012 mm (3.7008 to 3.7013 in.)
		Maximum		94.200 mm (3.7087 in.)

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Piston	Diameter	Standard		93.960 to 93.980 mm (3.6992 to 3.6999 in.)
		Maximum		93.830 mm (3.6941 in.)
		Distance		9.8 mm (0.3858 in.)
	Oil clearance	Standard		0.020 to 0.052 mm (0.0007 to 0.0020 in.)
		Maximum		0.06 mm (0.0024 in.)
	Ring groove clearance	Standard	No. 1	0.020 to 0.070 mm (0.0008 to 0.0028 in.)
			No. 2	0.020 to 0.060 mm (0.0008 to 0.0024 in.)
			Oil	0.070 to 0.150 mm (0.0028 to 0.0059 in.)
	Ring end gap	Standard	No. 1	0.25 to 0.35 mm (0.0098 to 0.0138 in.)
			No. 2	0.50 to 0.60 mm (0.0197 to 0.0236 in.)
			Oil	0.10 to 0.40 mm (0.0039 to 0.0157 in.)
		Maximum	No. 1	0.50 mm (0.0197 in.)
			No. 2	0.85 mm (0.0335 in.)
			Oil	0.60 mm (0.0236 in.)
	Piston pin hole inside diameter	Standard	Mark A	22.001 to 22.004 mm (0.8662 to 0.8663 in.)
			Mark B	22.005 to 22.007 mm (0.8663 to 0.8664 in.)
			Mark C	22.008 to 22.010 mm (0.8665 to 0.8665 in.)
	piston pin diameter	Standard	Mark A	21.997 to 22.000 mm (0.8660 to 0.8661 in.)
			Mark B	22.001 to 22.003 mm (0.8662 to 0.8663 in.)
			Mark C	22.004 to 22.006 mm (0.8663 to 0.8664 in.)
	Oil clearance	Standard		0.001 to 0.007 mm (0.00004 to 0.0003 in.)
		Maximum		0.015 mm (0.0006 in.)
	Bush inside diameter	Standard	Mark A	22.005 to 22.008 mm (0.8663 to 0.8665 in.)
			Mark B	22.009 to 22.011 mm (0.8665 to 0.8666 in.)
			Mark C	22.012 to 22.014 mm (0.8666 to 0.8667 in.)
	Oil clearance	Standard		0.005 to 0.011 mm (0.0002 to 0.0004 in.)
		Maximum		0.03 mm (0.0012 in.)
Crankshaft bearing cap set bolt	Diameter	Standard		10.8 to 11.0 mm (0.4252 to 0.4331 in.)
		Minimum		10.70 mm (0.4213 in.)
Cylinder head set bolt	Outside diameter	Minimum		10.70 mm (0.4213 in.)
Connecting rod bolt	Diameter	Standard		7.2 to 7.3 mm (0.283 to 0.287 in.)
		Minimum		7.0 mm (0.276 in.)

## TORQUE SPECIFICATIONS

Part Tightened		N*m	kgf*cm	ft.*lbf
Front suspension member reinforcement RH x Front crossmember		95	969	70
Front suspension member reinforcement RH x Front suspension crossmember		95	969	70
Radiator reservoir tank x Bract		5.0	51	44 in.*lbf
Engine coolant temperature sensor x Water outlet		20	204	14
Engine oil pressure sensor x Oil pan		21	214	15
No. 1 front engine mounting bracket LH x Timing chain cover		54	551	40
No. 2 idler pulley x Timing chain cover		43	438	32
No. 2 timing gear cover x Timing chain cover		6.0	61	53 in.*lbf
V-ribbed belt tensioner x Timing chain cover		43	438	32
V-ribbed belt tensioner x Cylinder block		43	438	32
Drive shaft bearing bracket x Cylinder block		64	653	47
Exhaust manifold LH x Cylinder head		21	214	15
No. 2 exhaust heat insulator x Exhaust manifold		8.5	87	75 in.*lbf
No. 2 manifold stay x Exhaust manifold		34	347	25
No. 2 manifold stay x Cylinder block		34	347	25
No. 1 oil dipstick guide x Cylinder block		21	214	15
No. 2 oil dipstick guide x Cylinder head		21	214	15
Exhaust manifold RH x Cylinder head		21	214	15
Intake manifold x Cylinder head		21	214	15
No. 2 engine mounting stay RH x Intake manifold		21	214	15
No. 2 engine mounting stay RH x Timing chain cover		21	214	15
Ignition coil x Cylinder head cover		10	102	7
Intake air surge tank x Intake manifold	5 mm hexagon wrench	18	184	13
	for Bolt	21	214	15
	for Nut	16	163	12
Vacuum hose clamp x Intake air surge tank		5.4	55	48 in.*lbf
Drive plate and ring gear x Crankshaft		178	1,815	132
Engine mounting bracket RR x Engine mounting insulator RR		95	969	70
Engine mounting bracket FR x Engine mounting insulator FR		145	1,479	107
Engine mounting bracket LH x Engine mounting insulator LH		56	571	41
Engine mounting insulator RH x Front No. 1 engine mounting bracket	for Bolt and nut A	95	969	70
	for Nut B	52	530	38
Front crossmember x Body	for Bolt A	96	979	71
Front suspension member x Body	for Bolt B	145	1,478	107
Front suspension member brace rear x Body	for Bolt C	145	1,478	107
	for Bolt D	93	948	69
Air cleaner case x Engine mounting insulator LH		5.0	51	44 in.*lbf
Battery bracket reinforcement x Body		19	194	14
Front battery bracket x Body		19	194	14
Front battery bracket x Battery bracket reinforcement		19	194	14
Battery clamp x Body		5.0	51	44 in.*lbf

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Part Tightened		N*m	kgf*cm	ft.*lbf
Connecting rod x Connecting cap	1st	25	255	18
	2nd	Turn 90°	Turn 90°	Turn 90°
Cylinder block x Crankshaft bearing cap	1st	61	622	45
	2nd	Turn 90°	Turn 90°	Turn 90°
	Main bearing cap bolt	52	530	38
Camshaft timing gear x Intake camshaft		100	1,020	74
Camshaft timing exhaust gear x Exhaust camshaft		100	1,020	74
Stud bolt x Cylinder block		10	102	7
Stud bolt x Cylinder head	for Stud bolt A and B	10	102	7
	for Stud bolt C	4.0	41	35 in.*lbf
No. 1 oil nozzle x Cylinder block		9.0	92	80
Cylinder block water drain cock x Cylinder block	1st	25	255	18
	Adjusting position	45 or less	459 or less	33 or less
Water drain cock plug x Water drain cock		13	130	9
Crankshaft position sensor x Cylinder block		10	102	7
No. 2 straight screw plug x Cylinder head		80	816	59
No. 1 straight screw plug x Cylinder head		44	449	32
Water inlet pipe x Cylinder block		10	102	7
Cylinder head (for Bank 1) x Cylinder block	1st	36	367	27
	2nd	Turn 90°	Turn 90°	Turn 90°
	3rd	Turn 90°	Turn 90°	Turn 90°
Cylinder head (for Bank2) x Cylinder block	1st	36	367	27
	2nd	Turn 90°	Turn 90°	Turn 90°
	3rd	Turn 90°	Turn 90°	Turn 90°
	Except bolt	30	306	22
Camshaft bearing cap x Camshaft housing (for Bank 1)	1st	10	102	7
Camshaft housing x Cylinder head (for Bank 1)		28	286	21
Camshaft bearing cap x Camshaft housing (for Bank 1)	2nd	16	163	12
Camshaft bearing cap x Camshaft housing (for Bank 2)	1st	10	102	7
Camshaft housing x Cylinder head (for Bank 2)		28	286	21
Camshaft bearing cap x Camshaft housing (for Bank 2)	2nd	16	163	12
No. 2 chain tensioner x Camshaft housing (for Bank 1)		21	214	15
No. 3 chain tensioner x Camshaft housing (for Bank 2)		21	214	15
No. 1 chain vibration damper x Cylinder block		23	235	17
Idle sprocket x Cylinder block		60	612	44
No. 1 chain tensioner x Cylinder block		10	102	7
Engine rear oil seal retainer x Cylinder block		10	102	7
Crankshaft pulley x Crankshaft		250	2,549	184
Oil pan baffle plate x Cylinder block		10	102	7
Front No. 1 engine mounting bracket x Timing chain cover		54	551	40



Part Tightened		N*m	kgf*cm	ft.*lbf
Cylinder head cover x Cylinder head (for Bank 1)	for Bolt A	21	214	15
	for Except bolt A	10	102	7
Oil pipe bracket x Cylinder head (for Bank 1)		10	102	7
Oil pipe union bolt x Cylinder head cover (for Bank 1)		65	663	48
Oil pipe union bolt x Cylinder head (for Bank 1)		65	663	48
Cylinder head cover x Cylinder head	for Bolt A	21	214	15
	for Except bolt A	10	102	7
No. 1 oil pipe union bolt x Cylinder head cover (for Bank 2)		65	663	48
No. 1 oil pipe union bolt x Cylinder head (for Bank 2)		65	663	48
Water outlet x Cylinder head		10	102	7
Camshaft timing oil control valve x Cylinder head cover		10	102	7
VVT sensor x Cylinder head cover		10	102	7
Spark plug x Cylinder head		18	184	13